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TAILORING SHIPBOARD TRAINING TO FLEET PERFORMANCE NEEDS: III. DEVELOPMENT OF DECKPLATE PROCEDURAL TRAINING FOR THE SHIPBOARD PROPULSION PLANT OPERATOR TRAINING (SPPOT) PROGRAM

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) In designing a shipboard training program for propulsion watchstanders, it was necessary to specify shipboard training strategies; identify skills and knowledges required by propulsion watchstanders; develop a description of the propulsion system aboard USS CONSTELLATION, where the project was being conducted; and develop algorithmic flow charts of watchstander procedures. The training program developed, called the Shipboard		

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Propulsion Plant Operator Training (SPPOT) program, included training modules and procedural, locational, and administrative training aids. Two types of procedural training aids were developed and evaluated aboard CONSTELLATION. Results showed that shipboard personnel considered the aids helpful in training. It appears that products developed under this project can be generalized to other parts of the fleet.

FOREWORD

This research and development was conducted within advanced development subproject Z1180-PN.01 (Enhancing Fleet Training Readiness Through Improved Shipboard Training) under the sponsorship of the Chief of Naval Operations (OP-01). The objectives of the subproject are to design, develop, and evaluate an approach for identifying critical fleet personnel readiness deficiencies and to develop shipboard training programs that are compatible with fleet priorities and the constraints of an operational environment.

This report is the third in a series being issued under this subproject. The first, NPRDC TR 78-30, described the general approach, which was designed for tailoring training systems to the requirements of shipboard environments, and a survey of shipboard performance problems conducted aboard three aircraft carriers. Survey results led to the selection of 1200 psi main propulsion systems as the target problem area for this project. The second report, NPRDC 81-23, described an analysis conducted to clarify the nature of the performance problems being experienced by main propulsion personnel. The current report describes the design and development of a shipboard training program for propulsion watchstanders and the evaluation of performance aids included in that program. In designing the program, initial algorithmic flow charts of watchstander procedures were developed under contract to NAVPERSRANDCEN by the Systems Engineering Association Corporation, San Diego. Subsequent reports will describe the development of additional SPPOT products, evaluation of SPPOT aboard USS CONSTELLATION, and generalization of SPPOT to other ships.

Appreciation is expressed for the high level of support and cooperation received from the Conventional Marine Propulsion Training Steering Committee; the staffs of Commander, Naval Air Forces, U.S. Pacific Fleet and the Personnel Qualification Standards Group, San Diego; and the Commanding Officer and Engineering Department personnel of CONSTELLATION. Without their help, the design and the development of SPPOT would not have been possible.

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SUMMARY

Problem and Background

The increasing complexity of shipboard performance requirements has strained the ability of the fleet to maintain personnel readiness through on-ship instruction. Further, the difficulties in providing shipboard training have been increased by personnel turbulence and changes in operational requirements. To address this problem, the Center is conducting an effort to design, develop, and evaluate a new approach to shipboard training that is more responsive to fleet priorities and compatible with the constraints of a shipboard environment.

This effort began with an investigation of existing fleet performance problems that resulted in the selection of main propulsion as a performance area for this research. Based on an analysis of propulsion performance problems, it was determined that a comprehensive training program was required to provide the ship with the ability to qualify and maintain a three-section Condition III main propulsion watch.

Purpose

The objective of this effort was to design a shipboard training program for propulsion watchstanders and to develop and evaluate an initial subset of training materials included in that program.

Approach

The approach used to develop the shipboard training program consisted of the following steps:

1. Specification of shipboard training strategies.

2. Identification of skills and knowledges required by propulsion watchstanders.

3. Development of description of propulsion system aboard USS CONSTELLATION (CV 64), where the project is being conducted.

4. Development of a comprehensive description of propulsion watchstander procedures.

Two types of procedural training aids, which were included in the training program, were then developed and evaluated by shipboard personnel.

Results

1. The following shipboard training strategies were specified:

a. On-the-job training (OJT) must be formalized.
b. Training materials must be designed for use in the working environment.
c. Training materials must be performance oriented.
d. Training should be focused on only those skills and knowledges needed by the watchstander for his immediate watch assignment.

2. Skills and knowledges required by propulsion watachstanders include the following:

a. Knowledge of procedural sequences.
b. Knowledge of functional sequences.
c. Awareness of consequences of inappropriate actions.
d. Familiarity with equipment/system operational characteristics.
e. Knowledge of operating ranges of equipment indicators.
f. Knowledge of equipment/component locations.
g. Ability to perform certain physical, perceptual, and interpretative tasks.

3. The description of the shipboard propulsion system included (a) a listing of 36 major systems linked to about 3,000 components requiring operator action, (b) a standard terminology for describing operator performance, and (c) a coding system for identifying classes of performance. Watchstander performance was detailed in 192 algorithmic flow charts providing complete procedures for most of the main propulsion systems.

4. Based on the information obtained, a shipboard training program, referred to as the Shipboard Propulsion Plant Operator Training (SPPOT) program, was designed. SPPOT included the following types of training materials: procedural training aids, locational training aids, training modules, and administrative aids.

5. The two types of procedural aids that were developed were the algorithmic flow charts and the SPPOT Guides. Results of the shipboard evaluation of these aids showed that, although respondents accepted both types of aids, they tended to be more positive toward the SPPOT Guide.

Conclusions

1. The SPPOT training development effort is producing effective instructional materials that can be used in shipboard environments and are suitable for generalization throughout the fleet to steam-powered ships.

2. The approach taken to develop shipboard training and the strategies applied during the design of SPPOT materials show promise for generalization to other task areas where shipboard training support is needed.

Recommendation

If subsequent studies confirm the effectiveness of the SPPOT program, the Chief of Naval Operations should consider adopting it throughout the fleet.

CONTENTS

INTRODUCTION

Problem

The increasing complexity of shipboard performance requirements has strained the ability of the fleet to maintain personnel readiness through on-ship instruction. Further, the difficulties of providing shipboard training have been increased by personnel turbulence and changes in operational requirements. Attempts to develop more adequate shipboard training systems have not met fleet requirements. A new approach to shipboard training is needed to produce instructional methods that are more responsive to fleet priorities and compatible with the constraints of a shipboard environment.

Background

To address this problem, the Navy Personnel Research and Development Center is conducting a project to design, develop, and evaluate an approach for identifying shipboard personnel readiness deficiencies and to develop training programs that are compatible with the operational shipboard environment.

The first report issued concerning this project described the general approach and a survey of shipboard performance problems conducted aboard three aircraft carriers (Main, Abrams, Chiles, Flaningam, & Vorce, 1978). Based on results of the survey, main propulsion systems was selected as the target problem area for this project.

The second report issued concerning this project described an analysis conducted to clarify the nature of the performance problems being experienced by main propulsion personnel (Chiles, Abrams, Flaningam, & Vorce, 1981). Results indicated that, since many steam propulsion ships are not able to maintain three fully qualified watch sections over extended periods of time, the abilities of propulsion personnel and the conditions of steam propulsion plants have seriously degraded. A number of related factors contributing to this problem were identified. For example, most of the Boiler Technician (BT) and Machinist Mate (MM) personnel sent to the fleet receive the major portion of their watchstander training on-ship. Almost half do not attend a Class "A" school. Also, personnel turbulence, caused by high rates of attrition and reassignment, has tended to increase the rate at which new personnel must be trained and qualified. By the same token, the rapid loss of experienced, qualified personnel drains the ship's technical expertise to the point where the remaining personnel often do not have the ability to train new watchstanders. Even in cases where experienced personnel are available to train new watchstanders, they are greatly handicapped by situational constraints. Operating engineering (propulsion) spaces are usually noisy, crowded, hot, uncomfortable, and not at all suited to formal instructional presentations. Most ships do not have adequate facilities for conducting propulsion training outside of the propulsion spaces. For those that do, it is difficult to find time for conducting extensive training programs. Most of the propulsion watchstander's time is spent in the propulsion spaces standing watches and performing maintenance. Consequently, the bulk of this training has to take place in the work environment if it takes place at all.

A primary interest in the overall effort is to determine whether performance problems created by a lack of experienced and qualified personnel could be reduced by introducing training programs tailored for shipboard environments. Based on results obtained by Chiles et al., it was determined that the training program to be developed would focus on propulsion watchstander performance, cover all major plant operational tasks performed by BTs and MMs, and attempt to establish a qualified three-section steaming watch.

Purpose

The purpose of the effort described herein was to design and develop a shipboard training program for propulsion watachstanders and to evaluate an initial subset of training materials included in that program.

DEVELOPMENT OF SHIPBOARD TRAINING PROGRAM FOR PROPULSION WATCHSTANDERS

The approach used to develop the shipboard training program for propulsion watchstanders consisted of four steps:

1. *Specification of shipboard training strategies.*

2. Identification of skills and knowledges required by propulsion watchstanders.

3. Development of description of propulsion system aboard USS CONSTELLATION (CV 64), where project is being conducted.

4. Development of algorithmic flow charts describing watchstander procedures.

These steps are described in the following paragraphs.

Specification of Shipboard Training Strategies

Constraints of the main propulsion shipboard environment and training resources (e.g., time, space, instructors, and materials available to conduct training) were identified through shipboard observations, both in port and at sea, and through interviews with technical experts from: (1) engineering departments aboard CONSTELLATION (CV 64), KITTY HAWK (CV 63), RANGER (CV 61), KENNEDY (CV 67), and EDSON (DD 946), (2) type commander staffs on both coasts, (3) the Propulsion Examining Board (PEB), (4) the Personnel Qualification Standard (PQS) Development Group, (5) the Naval Sea Command (PMS-301), and (6) the conventional Marine Propulsion Training Steering Committee. Based on results obtained, the following training strategies were specified:

1. On-the-job training must be formalized. Because of the conditions imposed on propulsion watchstanders, it is difficult to conduct extensive training programs for them outside of the work environment. As a result, current shipboard training programs for these personnel emphasize OJT. OJT not only allows the trainee to learn while he is assigned to a watch station, but also keeps the trainee involved with the actual spaces and equipment with which he will be working. In a sense, the equipment and systems themselves become training aids that the trainee interacts with in learning his job. Finally, since current OJT for watch qualification is guided by the PQS system, an OJT orientation provides a ready-made link to PQS.

As currently conducted, however, OJT is performed on an informal basis without the availability of supporting training materials. There are few controls to assure that the training is sufficiently clear and comprehensive, or that it provides each watchstander trainee the specific information he needs when he needs it. Also, since OJT is provided by other watchstanders, its quality depends greatly upon the knowledge and teaching skill of those watchstanders. There are presently too few skilled and qualified watchstanders to maintain an effective OJT program. Based on these factors, it was determined that a basic training strategy should be to formalize on-going OJT and provide solutions to current OJT deficiencies; that is, to provide a content and a structure for OJT that supports the transfer of knowledge from the qualified watchstander to the trainee.

2. Training materials must be designed for use in the training environment. To support OJT, the training materials must be usable in the working environment or, in the language of the propulsion personnel, "on the deckplates." Such a requirement places a number of restrictions on the types of materials that can be used:

a. They must require a minimum of storage space, because space on the deckplates is severely limited.

b. They must be usable in situations where the trainee is climbing around, under, and over equipment to trace systems and learn procedural tasks.

c. They must be small and easy to handle. Ideally, the watchstander should be able to carry them in his pockets.

d. Since propulsion spaces are humid and oil and grease are difficult to avoid, materials must be highly durable. To survive over time, they must be laminated or otherwise protected from the envoronment. Otherwise, continuous replacements must be available, which would create further storage problems.

3. Training materials must be performance-oriented. Performance-oriented writing contrasts with topic-oriented writing, which focuses on generalizations and concepts. Topic-oriented manuals do not identify the user, describe what duties and tasks should be performed, and indicate how they should be accomplished. The requirements for performance-oriented literature, as described by Kern, Sticht, Welty, and Hauke (1975), are as follows:

> Performance-oriented writing focuses on the duties and tasks a user is expected to perform and the information he needs to perform these duties and tasks--it tells the user "what to do" and, where possible, "how to do it."
>
> Performance-oriented manuals identify a particular user audience. To write performance-oriented literature, you start by identifying who you expect the major user to be and the subject-related duties and tasks this user will perform. You then translate your knowledge of the subject area into the information and directions this user will need to learn and perform the duties and tasks you have identified.
>
> In performance-oriented writing, information is selected from the "body of knowledge" and organized to place major emphasis upon its application to duty and task performance. It "talks" directly to the user, the duties and tasks he is expected to perform, and how he can perform them. As a result, performance-oriented literature has greater relevance to a job-training or job-performance setting than topic-oriented literature. The reader does not have to strain the information he needs out of the general pot of knowledge and then wrestle with the "so what should I do about it" questions. (pg. 6)

Performance-oriented materials are particularly advantageous for shipboard training. For example, training can be structured so that study of equipment characteristics is linked to real or simulated practice on actual equipment. Training evaluations can also emphasize the ability to perform rather than to answer questions about an equipment or process.

4. Training should be focused on only those skills and knowledges needed by the watchstander for his immediate watch assignment. In qualifying for watchstations, propulsion personnel progress through a series of increasingly complex and demanding watch responsibilities. The more theory and systems knowledge the trainee has mastered, the greater the probability that he will be able to perform his work correctly and have the capability to respond to unexpected circumstances. On the other hand, knowledge requirements increase the time needed for a trainee to qualify for a watch. A heavy front-loading in fundamentals and system relationships can seriously delay an individual in becoming a productive member of the watch team and, therefore, contribute to the overall problem of maintaining three qualified watch sections. Limiting knowledge requirements to those that will be immediately used on the job has the following advantages:

a. The knowledge will quickly be put to use and therefore less likely to be forgotten.

b. Watchstanders are normally mechanically-oriented and understandably resistant to being overloaded with abstract information. Thus, if they know that knowledge gained will be put to use directly, their motivation should increase.

For these reasons, it was decided that each watchstander would be provided only that training content needed to qualify him for immediate watch responsibilities.

Identification of Skills and Knowledges Required by Propulsion Watchstanders

The types of skills and knowledge required by propulsion watchstanders to perform their jobs effectively were identified based on shipboard observations, interviews with technical experts, and a review of the following relevant documentation:

1. The Engineering Operational Sequencing System (EOSS).
2. Qualification Section 7 of the Personnel Qualification Standard (PQS) for CONSTELLATION.
3. The Engineering Department's Organizational Manual (EDORM).
4. The Plant Operating Guide (POG).
5. The Propulsion Plant Manual (PPM).
6. Technical manuals (relating to 1200 psi propulsion plants).
7. Manufacturers' technical manuals on specific equipments.
8. Navy occupational standards.
9. Navy Class "A" propulsion school task analysis documents.
10. Advancement in rating manuals for BTs and MMs.

From information obtained, it was determined that main propulsion watchstanders require the following skills and knowledges:

1. Knowledge of procedural sequences. Each propulsion watchstander has a specific set of operations or tasks that he must perform and coordinate with the rest of his watch team. A large proportion of these tasks is highly procedural in nature, consisting of extensive series of sequential actions. For many of these actions, the manner and order in

which they are performed are extremely important. Improper actions may result in serious personnel injuries, extensive damage to expensive equipments, and the loss of the ship's ability to steam and operate.

2. Knowledge of functional sequences. Sequences of actions are paralleled by sequences of functions. For example, a specific set of valves may have to be closed to isolate a particular equipment from steam pressure. In this case, the function of the action is to isolate the equipment from steam. If watchstanders are to perform their tasks intelligently, they must know what functions are satisfied by each series of actions they perform. Otherwise, they could make careless errors and not even recognize them as such. For example, propulsion messengers have been known to log-in readings that indicate a drop in oil temperature as it passes through a hot bearing without recognizing the incongruity of their action.

3. Awareness of consequences of inappropriate actions. Watchstanders not only need to know what actions and functions should be performed, but also need to be aware of the consequences of not performing such actions correctly. If they are not, they are unlikely to be sufficiently motivated to follow procedures conscientiously. To perform a procedure correctly may take considerable time and effort. Shortcuts are often possible, and the results of improper procedures do not always have a direct observable impact on plant operation.

Knowledge of consequences does not imply a sophisticated understanding of equipment and system functions or of engineering principles. For example, a MM messenger can be taught that a failure to drain condensate from a turbine will result in drops of water being propelled like bullets by high velocity steam into the turbine blades and cause extensive damage to the equipment. He doesn't need to understand in detail how this process occurs to appreciate the effects.

4. Familiarity with equipment/system operational characteristics. Beyond simple cause and effect relationships, the watchstander must be familiar with the characteristics of the equipment and systems that he operates, and must know how they function and interact with other equipment and systems. Such knowledge requirements may be at a very basic level for entry watch stations and at a much higher level for senior watch positions. A knowledge of operational characteristics provides a logical framework for the trainee that can speed learning and facilitate retention. His actions are meaningful because he can relate them to the operational requirements of the plant. He can generalize previously learned skills to new tasks because he recognizes similarities in the way the equipment functions. He can perform with greater flexibility under unusual conditions that cannot be procedurally programmed in advance.

5. Knowledge of operating ranges of equipment indicators. A major portion of watchstander duties involve monitoring pressures and temperatures on indicating devices to ensure equipment and components are functioning properly. To perform these tasks efficiently and continuously, the watchstander must learn the correct operating ranges of his equipment. He typically does this by rote through frequent repetition.

6. Knowledge of equipment/component locations. A watchstander must learn the location of all the equipment and components that he is responsible for checking or operating. Typically, he learns this by tracing each system down on the deckplates and by being exposed to the equipment and systems over time.

7. Ability to master certain physical, perceptual, and interpretive skills. Finally, there are a variety of physical, perceptual, and interpretive skills that a watchstander

must master. Most of these skills, such as reading a meter, cleaning a boiler burner, or inspecting a lube oil sample, can be readily taught without much problem. Some, however, such as the ability to recognize an inappropriate type of noise in an operating pump, may be difficult to acquire without considerable experience and practice.

Development of Description of Shipboard Propulsion System

A complete and accurate description of the CONSTELLATION propulsion system was obtained by physically tracing the systems onboard CONSTELLATION and identifying each component that is checked or manipulated by a watchstander. This was done by experienced Navy subject-matter experts (SMEs), primarily MM and BT chief petty officers (CPOs) from the Mobile Training Team of Commander U.S. Naval Air Forces, U.S. Pacific Fleet, working in close conjunction with project personnel and with main propulsion personnel from CONSTELLATION.

The description included (1) a listing of 36 major systems linked to approximately 3,000 components requiring operator action, (2) a standard terminology for describing operator performance with respect to each component, and (3) a coding system for identifying classes of performance. Figure 1 displays a sample page from the system description showing several components belonging to the forced draft air system. As shown, each component identified is followed by (1) a description of actions performed on the component and (2) symbolic codings for each of the actions listed under behavior columns (e.g., A--Open). The codings typify the type of actions being performed and were provided to facilitate recongition of patterns of actions that occur from one system to another.

Development of Description of Watchstander Procedures

Using the system description as a reference, a total of 192 separate algorithmic flow charts were developed by contractor personnel, providing complete procedures for 32 of the 36 main propulsion systems. The charts covered all major evolutions (i.e., pre-sort, align, start-up, operate, and secure) for each system, and reflected differences between propulsion spaces. The algorithmic flow charts depicted the sequential flow of the specific actions involved in performing a procedure.

The charts were algorithmic in the sense that they provided decision points with alternate paths of actions. Branching paths were used to indicate where parallel operations could be performed simultaneously, where only one of several possible operations was to be performed, or where different paths would be followed depending on the nature of the situation. The latter type of branching technique was used extensively where remedial paths were required; that is, if a certain reading or condition could not be obtained as specified, a series of steps for correcting or otherwise responding to the inadequacy were listed. These remedial paths were one of the primary characteristics of the algorithmic flow charts that differentiated them from existing procedural documents.

Each flow chart was designed to depict a single evolution for a single system (e.g., start the forced draft blower or secure the main steam system). Since each chart covered all of the actions involved in performing the evolution, the actions of more than one watchstander were included on a single chart. Where system characteristics differed from one propulsion space to another, separate charts were prepared for each space. Figure 2 displays a sample portion of the flow chart for starting a forced draft blower.

2.0 FORCED DRAFT AIR SYSTEM		A OPEN	B CLOSE	C POSITION	D ADJUST	E REGULATE	F CHECK STATUS	G CHECK/INSPECT	H OBSERVE	I MAINTAIN	J COMMUNICATE	K MISCELLANEOUS
2.1 AIR CASING SUPPLY												
2.1.1 MOTOR DRIVEN FORCED DRAFT BLOWER	LISTEN OPERATING						1a					
2.1.1.1 CUTOUT SHUTTER	FULLY OPEN TO ALIGN: FULLY CLOSE TO REALIGN: VISUALLY OBSERVE POSITION: ORDER/REPORT/ RECORD ACTIONS	3a	2a				11			1,2a 3a		
2.1.1.2 CONTROLLER SWITCH	PUSH/PULL TO START/STOP ORDER/RECORD ACTIONS			3bc						1a 3a		
2.1.1.3 INLET SCREEN COVER	VISUALLY OBSERVE POSITION: VISUALLY OBSERVE DISPLACEMENT: ORDER/REPORT ACTIONS: COVER/UNCOVER						11	1b		1.2a	3,4	
2.1.1.4 INLET SCREEN	VISUALLY OBSERVE POSITION/DIRT/ DISPLACEMENT/DAMAGE: ORDER ACTION REPORT CONDITION						11	1abc		1a 2b		

Figure 1. Sample page from system description.

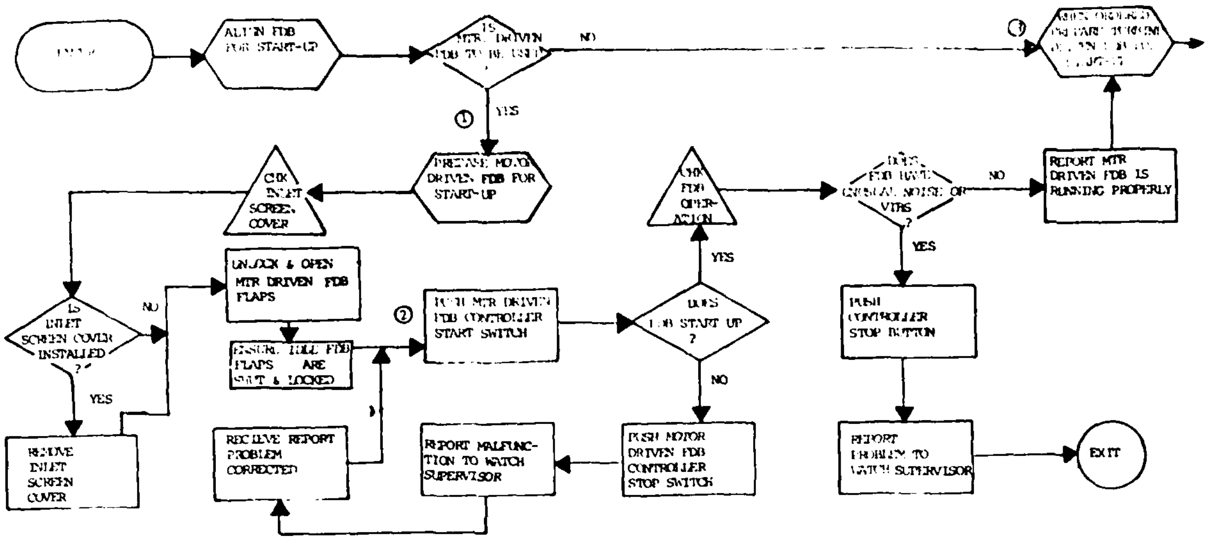

Figure 2. Portion of the algorithmic flow chart for starting a forced draft blower.

Design of Shipboard Training Program

Based on the identification of skill and knowledge requirements and descriptions of procedures that were developed, a shipboard training program was designed. This program, referred to as the Shipboard Propulsion Plant Operator Training (SPPOT) program, was designed to provide a number of different types of training materials and management guides to accommodate the variety of skill and knowledge requirements identified for propulsion watchstanders. These types of materials, which are designed to integrate with existing shipboard training and management systems, are described below.

1. Procedural training aids are designed for use in conjunction with deckplate OJT covering watchstander operating procedures. Procedural aids indicate all of the detailed actions involved in performing a procedure. Where possible, they include amplifying information to clarify the reasons for the actions and the consequences of not performing the actions correctly.

2. Locational training aids consist of mappings of the propulsion plant that show the physical location of equipments in the upper and lower levels of each machinery space. These aids support the present OJT practice of having trainees trace the various systems that they must work with, giving the location of piping, valves, and other components that make up the system. A completed set of correct system tracings assists supervisors in checking the accuracy of trainee system tracings.

3. Training modules provide a more detailed knowledge of the operational characteristics of systems, equipments, and components than can be readily detailed in the context of describing a procedure. Two general types of training content are

provided: (a) orientation content that provides background information relevent to all watch station duties, and (b) watch station content that is specific to the specialized requirements of each watch station.

4. Administrative aids include: (a) instructor guides that explain how SPPOT materials are to be used in conducting OJT and evaluating watch qualification, (b) a SPPOT PQS document that indicates which SPPOT materials are relevent to PQS qualifications and provides for sign-off of completed items, and (c) procedures for organizing and managing the SPPOT program.

DEVELOPMENT AND EVALUATION OF PROCEDURAL TRAINING AIDS

The first actual training products to be developed were procedural training aids. These products were designed to depict the flow of action sequences performed by the watchstander as established in the algorithmic flow charts. The design and development of these initial products were guided by (1) the training strategies established earlier in the project, and (2) interviews with propulsion personnel from CONSTELLATION and RANGER, and with aircraft carrier type commander staffs on both coasts.

Algorithmic Flow Charts

The format for the initial training aid was simply a 14" x 18" laminated version of the algorithmic flow charts that had been developed as a data base. These charts were distributed aboard CONSTELLATION during September 1979 and were stored in metal containers at appropriate watch stations. Watchstanders were given the opportunity to review and reference these charts in preparation for a light-off examination by the Propulsion Examination Board (PEB). Following the examination, 80 propulsion watchstanders (5 officers, 10 CPOs or first class petty officers (PO1s), 30 second or third class officers (PO2s or PO3s), and 35 firemen or firemen apprentices (FNs or FAs)) were surveyed to determine their reactions to the charts, their design, the quality of the information provided, and their usefulness in terms of aiding training and improving performance. Interviews were held on the ship on an individual basis. A copy of the survey questionnaire is displayed in Appendix A.

Table 1, which provides survey results, shows that, in general, reactions to the charts were highly positive. The great majority of respondents indicated that the charts would facilitate training of watchstanders, make it easier for them to perform correctly, and reduce damages and injuries. Responses were particularly favorable from experienced, higher level enlisted personnel.

Although respondents noted some omissions or incorrectly sequenced steps, virtually all agreed that there were not many errors in the charts. Individual comments tended to rate the accuracy of the documents favorably in comparison to other types of documents that they had used.

Respondents were more divided as to the layout and physical design of the charts. Although most respondents found the charts "easy" to understand and use, a sizeable proportion of the lower rated personnel found them "somewhat difficult" to "difficult." Most problematic was the issue of storage. Officers seemed especially concerned about the difficulties involved in handling and storing the large charts.

In commenting on the charts, a few participants claimed that they had problems with the nomenclature or that they were confused by the complex branching configuration of the format. Understandably, the great majority of these comments came from personnel

Table 1

Responses to Algorithmic Flow Charts

Item	Response	Percent of Response Groups: Officer (N = 5)	CPO or PO1 (N = 10)	PO2 or PO3 (N = 30)	FN or FA (N = 35)
Performance	Much Easier	20	90	43	14
	Easier	80	10	50	49
	No Easier	0	0	7	37
Training	Much Easier	100	80	60	41
	Easier	0	20	37	50
	No Easier	0	0	3	9
Reduce Damage and Injuries	Very Much	80	70	24	12
	Somewhat	20	30	72	81
	None	0	0	3	6
Contain Needed Information	Always	80	44	27	47
	Generally	20	56	73	53
	Seldom	0	0	0	0
Contained Errors	Many	0	0	0	0
	Some	80	70	79	33
	Few	20	30	21	67
Understanding	Easy	100	90	53	53
	Somewhat Difficult	0	10	47	44
	Difficult	0	0	0	3
Following Steps	Easy	60	70	57	56
	Somewhat Difficult	40	30	40	32
	Difficult	0	0	3	12
Finding Procedures	Easy	40	88	66	55
	Somewhat Difficult	60	13	24	45
	Difficult	0	0	10	0
Handling and Storage	Easy	0	63	47	56
	Somewhat Difficult	40	38	33	24
	Difficult	60	0	20	21

Note. Numbers indicate the percent of each group that gave a given response. Although some of the participants did not answer all of the questions, no more than two responses are missing in any given cell.

with the least experience--the firemen and firemen apprentices. Suggestions were also made for improvements in packaging, size, durability, readability, etc.

SPPOT Guides

While the flow charts provided a satisfactory documentation of watch procedures, their evaluation indicated a number of shortcomings as training documents. An effort was made, therefore, to reformat the charts into a product more suitable for training purposes. The result of this effort was the SPPOT Guide: a small, laminated, pocket-sized version of the algorithmic flow charts. Samples of these aids are displayed in Appendix B.

Differences Between SPPOTS Guides and Algorithmic Flow Charts

In contrast to the algorithmic flow charts, which require complex branching patterns, SPPOT Guides have a linear format, making it possible to depict procedures sequentially on a number of pages. This depiction allowed use of a larger print size and a pocket-size packaging that was more in accord with user requirements.

SPPOT Guides also differ from the algorithmic flow charts in content. The algorithmic flow charts are similar in content to what Post and Price (1973) have characterized as "directive" performance aids; that is, they indicate what actions are to be taken but provide no insight as to the reason for the action or the functional characteristics of equipments involved. Since Post and Smith (1979) demonstrated that including explanatory information in directive aids can facilitate the trainee's transition from highly directive procedural information to less directive performance guides (such as are provided by EOSS documents), it was decided to include functional statements in the SPPOT Guides. To prepare these statements, SMEs (BT and MM chief petty officers) grouped series of sequential actions contained in the algorithmic flow charts according to functional units. Training professionals working with the SMEs then provided the functional statements to characterize each of these units.

These functional statements are identified in the SPPOT Guides according to a decimal notation. For example, SPPOT Guide 2-S, which concerns the motor driven forced draft blower (FDB), includes the following sequence:

1.0 PREPARE/START MTR. DRV. FDB

1.1 PREPARE FOR AIR FLOW TO BOILER
BE SURE THE INLET SCREEN COVER IS REMOVED
UNLOCK AND OPEN MTR. DRV. FDB FLAPS
BE SURE IDLE FDB FLAPS ARE SHUT & LOCKED

1.2 START MTR. DRV. FDB & BE SURE IT OPERATES PROPERLY
PUSH THE CONTROLLER "START" SWITCH

Note that two levels of functional statements are provided in this example, with the 1.0 statement representing a higher order function than the 1.1 statement. The higher level functional statements are used to provide a conceptual overview of procedures. It is felt that such an overview aids the trainee in understanding propulsion procedures and recognizing meaningful relationships among functional units.

Since some of the more complicated procedures proved difficult to translate into a linear format, a number of strategies were developed for dealing with such problems.

These strategies, which might be of particular interest to those contemplating efforts to design similar procedural aids, are discussed in Appendix C.

In addition to the changes already mentioned, an attempt was made to improve the verbal content of the algorithmic flow charts. This was done by eliminating unnecessary verbiage, standardizing terminology, and eliminating some abbreviations that were found to be confusing in the charts.

Supplement to SPPOT Guides

A supplement to the SPPOT Guides was designed, consisting of sets of statements that caution trainees as to what can happen if critical actions are not performed correctly. To ensure that these caution statements were displayed in close proximity to the diagrams describing the procedural actions, they were attached to the back of the appropriate SPPOT Guide and keyed to appropriate steps in the SPPOT Guide by use of letter designations.

The supplements were intended to serve both an instructional and an evaluative role during on-line demonstrations of operational procedures. In first introducing a trainee to a new watch task, the instructor can use the supplement to remind the trainee about the various hazards that can result from improper procedures. Later, when the trainee is being evaluated to determine if he is qualified for a given watch station, the evaluator can use the statements as questions to determine if the trainee knows the consequences of performing a particular action incorrectly.

The criterion provided for generating these statements specified that a caution be provided only when serious consequences are involved and an improper action is likely to occur. Statements were designed to contain three separate parts:

1. The inappropriate action (if soot blower fresh water drains are not opened or are closed too soon . . .).

2. The result (it will cause damage to valves and piping with possible steam leaks resulting in personnel injury . . .).

3. The reason (because of water hammering due to undrained condensate . . .).

Note that the reasons given at this point do not involve detailed explanations. During deckplate demonstrations, long involved explanations are not feasible because they would interrupt the procedural sequence and because it is difficult to communicate in that environment. It was intended that these terse explanations would be backed up by information provided in instructional manuals that would allow depictions of the internal status of equipment. The plan was not to eliminate off-line instruction but to reduce it to simply that information that could not be taught adequately on-line through demonstrations.

Evaluation of SPPOT Guides

During December 1979, a survey questionnaire was administered to 37 propulsion watchstanders aboard CONSTELLATION (3 officers, 7 CPOs or PO1s, 16 PO2s or PO3s, and 11 FNs or FAs), to compare the effectiveness of the SPPOT Guides and the algorithmic flow charts. Respondents were shown samples of the SPPOT Guides and asked to compare them against the previously used algorithmic flow charts in terms of general training utility and in terms of ability of personnel to understand why actions are performed, understand terminology and abbreviations, locate and follow procedures, and handle and store materials. Interviews were held on ship on an individual basis. A copy of the survey questionnaire is contained in Appendix D.[1]

Table 2, which presents survey results, shows that, in general, responses strongly favored the SPPOT Guides over the charts. Almost all respondents indicated that the action sequences in the SPPOT Guides were easier to understand, locate, and follow and would have greater utility for training than would the charts. Although respondents differed only slightly with regard to terminology and use of abbreviations, they still tended to favor the SPPOT Guides. In terms of handling and storage, the SPPOT Guides were almost totally favored over the charts. Open-ended comments by respondents indicated that they believed the SPPOT Guides would materially assist them in learning how to operate their propulsion plant.

Table 2

Comparison of Algorithmic Flow Charts and SPPOT Guides

		Percent of Response Groups			
Item	Preference Indicated	Officer (N = 3)	CPO or PO1 (N = 7)	PO2 or PO3 (N = 16)	FN or FA (N = 11)
Training Utility	SPPOT Guide	100	100	75	100
	Flow Chart	0	0	6	0
	Neither	0	0	19	0
Understanding Actions	SPPOT Guide	100	86	88	66
	Flow Chart	0	0	0	17
	Neither	0	14	13	17
Understanding Terminology	SPPOT Guide	33	0	13	45
	Flow Chart	0	0	7	0
	Neither	67	100	80	55
Ability to Follow Procedures	SPPOT Guide	67	100	88	100
	Flow Chart	33	0	13	0
	Neither	0	0	0	0
Ease of Use	SPPOT Guide	67	86	88	91
	Flow Chart	33	0	0	9
	Neither	0	14	13	0
Ease of Storage	SPPOT Guide	100	100	94	100
	Flow Chart	0	0	6	0
	Neither	0	0	0	0

[1]Since the SPPOT supplements were not completed at the time of the evaluation, they were not included in the survey.

CONCLUSIONS

Initial evaluation of the procedural training aids indicated that these products have strong user acceptance and show considerable promise for facilitating shipboard training in propulsion operations. Effective use of these materials should speed watch qualification, thereby promoting worker productivity and contributing to the ability of the engineering department to maintain three qualified watch sections. Based on these initial positive responses, it appears that the SPPOT development and evaluation effort will achieve projected goals and should be continued.

In addition to developing and evaluating SPPOT on a single platform, attention should be given to expanding the scope of SPPOT's application. Most steam powered ships have watchstander training problems similar to those found onboard CONSTELLATION. Propulsion personnel do not have the time or facilities to conduct training effectively with conventional methods. The basic strategies used in developing SPPOT directly address such constraints and, further, provide training that is compatible with existing fleet training programs and policies. For these reasons, it is expected that SPPOT materials will generalize effectively to other types of steam powered ships.

The general approach taken in this effort involved the tailoring of training materials to meet shipboard training requirements in any task area. The strategies developed on the basis of this approach (formalization of OJT, using performance-oriented training materials, etc.) are not only relevant to propulsion tasks but to many of the types of task conditions found in shipboard environments. Problems such as lack of experienced personnel, time, and facilities for training are not peculiar to propulsion watchstanders but are common conditions in the fleet. To this extent, the general training development approach taken by this effort and the strategies developed in the design of SPPOT materials show promise for generalization to other task areas where shipboard training support is needed.

RECOMMENDATION

If future studies confirm the effectiveness of the SPPOT program, the Chief of Naval Operations should consider adopting it throughout the fleet.

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APPENDIX A

SURVEY QUESTIONNAIRE ON PROPULSION ALGORITHMS

PROPULSION ALGORITHM QUESTIONNAIRE

The purpose of this questionnaire is to find out how useful the propulsion algorithms were for assisting you to light off/start up your plant. As an experienced professional, you are in the best position to decide what works and what does not. Your opinions will help us make these algorithms as useful as possible. Thanks for you help!!!

NAME: (Optional) ____________________

WATCH STATION OR JOB TITLE: ____________________

RATE/RANK: ____________________

LENGTH OF MAIN PROPULSION EXPERIENCE: ____________________

1. Did you get to work with (or observe the use of) any of the algorithms?

   Yes ___ No ___

   If yes, for which tasks?

   ____
   ____
   ____
   ____

2. Do you believe that the algorithms would make it easier to train new watchstanders?

   Much Easier ___ Easier ___ No Easier ___

   Can you explain your answer?

   ____
   ____
   ____
   ____

3. Do you believe that using these algorithms would reduce equipment damage and/or personnel injuries?

   Very Much ___ Somewhat ___ None ___

   Can you give examples?

   ____
   ____
   ____
   ____

4. Did you find that the algorithms contained the information needed to perform the task?

Always ___ Generally ___ Seldom ___

What type of information, if any, should be added or dropped?

____
____
____
____

5. Did you find the algorithms to contain errors?

Many ___ Some ___ None ___

If you found errors, can you give examples?

____
____
____
____

6. How easy was it to understand the algorithms?

Easy ___ Somewhat Difficult ___ Difficult ___

If difficult, can you explain?

____
____
____
____

7. How easy was it to follow the steps without losing your place?

Easy ___ Somewhat Difficult ___ Difficult _____

If difficult, can you explain?

____
____
____
____

8. How easy was it to find the procedures that you needed for each task?

Easy ___ Somewhat Difficult ___ Difficult ___

If difficult, can you explain?

9. How easy was it to handle and store the algorithms?

Easy ___ Somewhat Difficult ___ Difficult ___

Can you suggest any better ways for doing this?

10. Can you think of any ways to improve the algorithms?

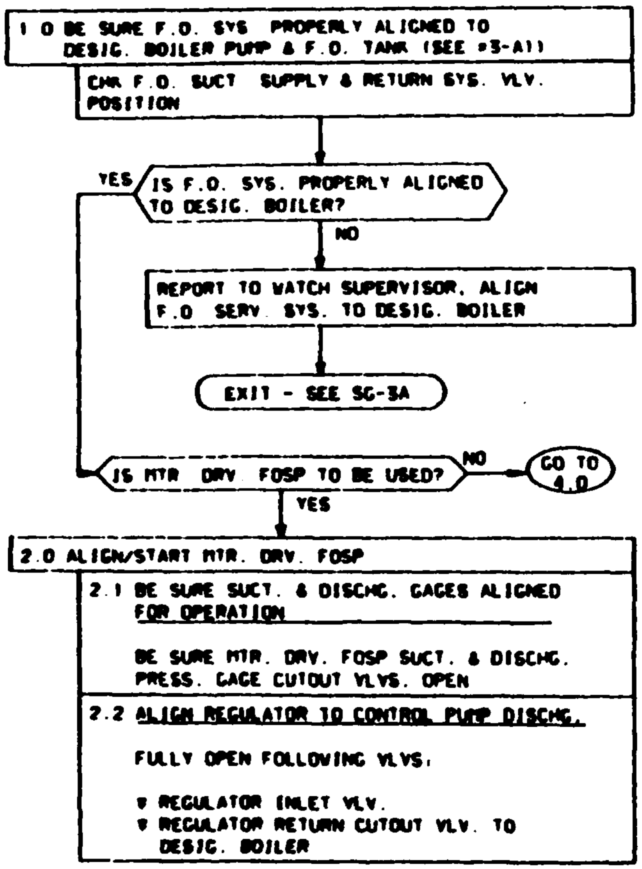
11. Please add any other comments you feel to be important.

APPENDIX B

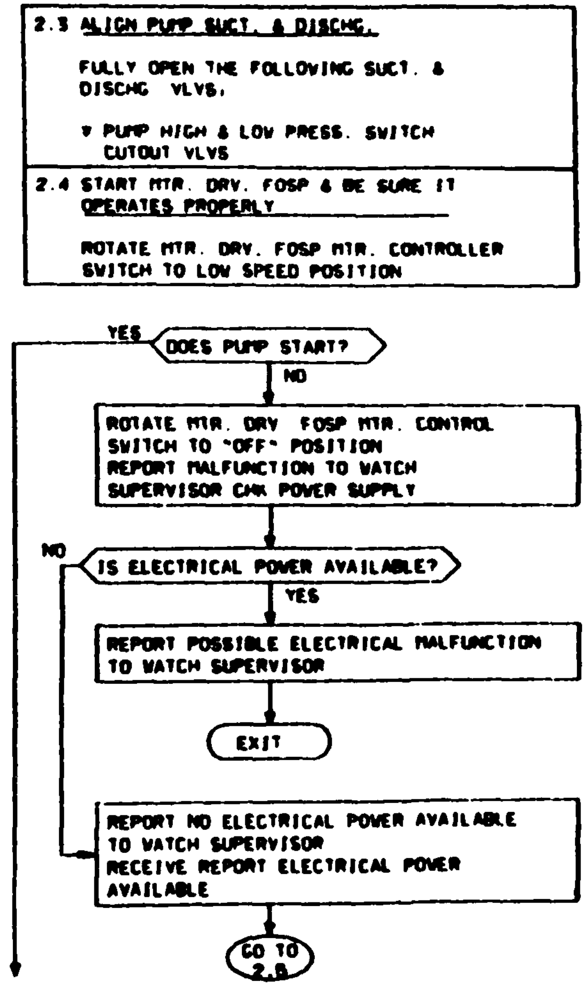
SAMPLE SPPOT GUIDE

SPPOT GUIDE 3-S

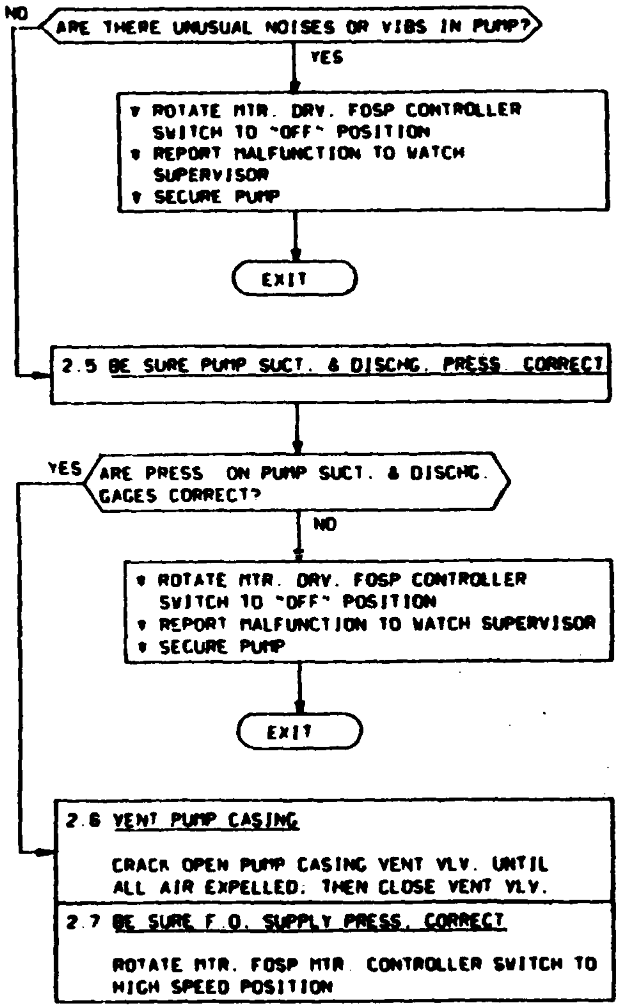
START FUEL OIL SERVICE PUMP



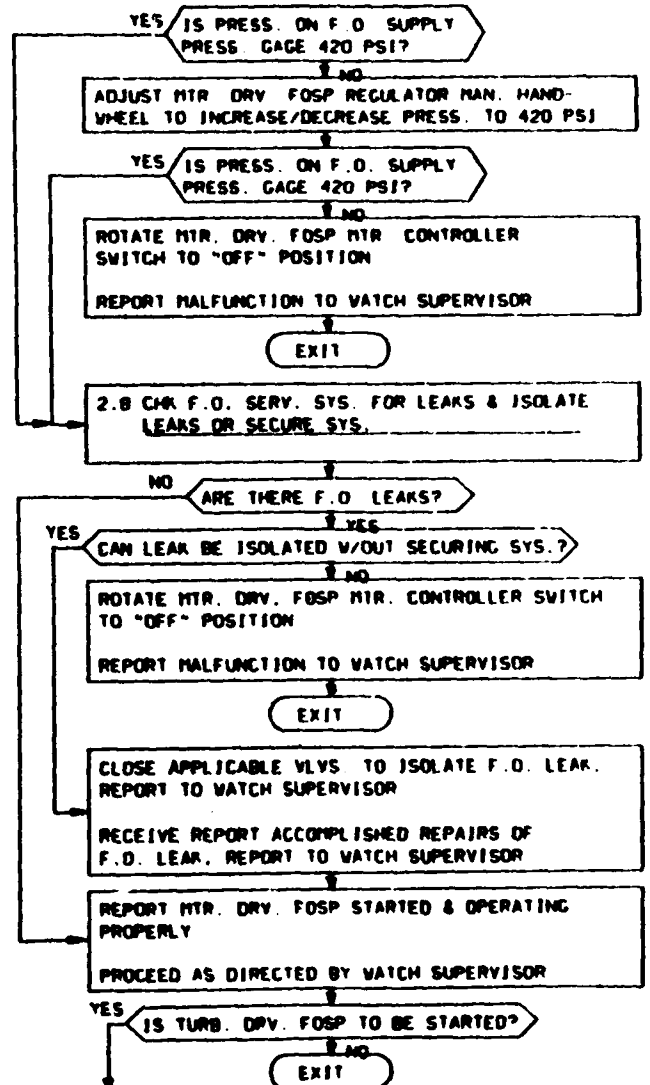
SG 3-S PG 1 OF 13



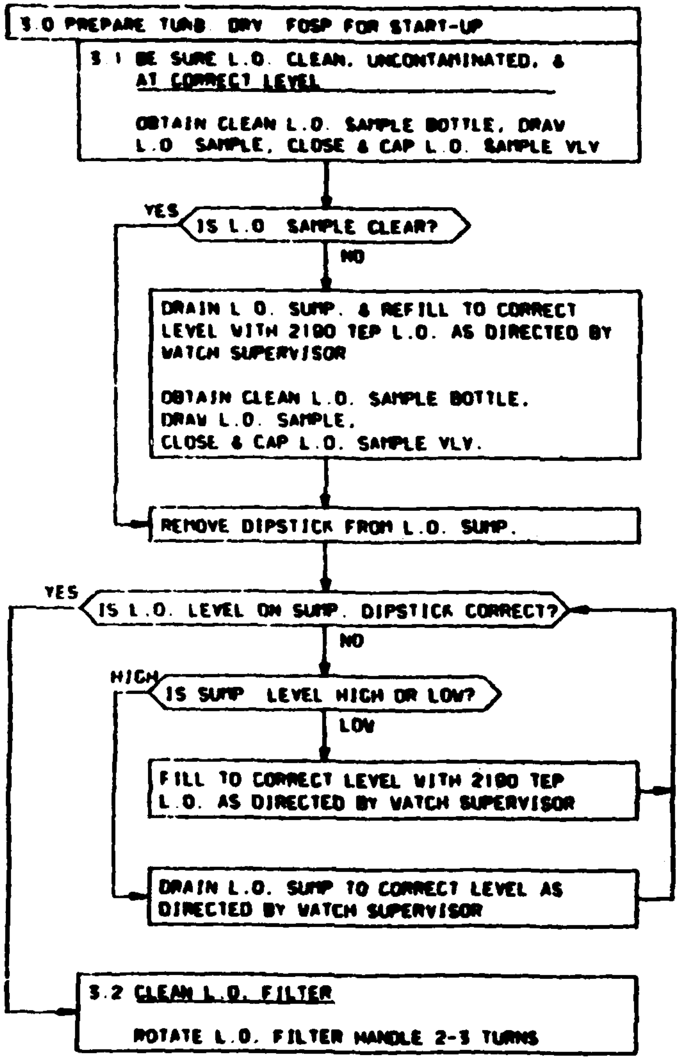
SG 3-S PG 2 OF 13



SG 3-S PG 3 OF 13



SG 3-S PG 4 OF 13



SG 3-S PG 5 OF 13

3.3 CHK SPEED LIMITING GOVERNOR ARM FOR PROPER MOVEMENT

BE SURE SPEED LIMITING GOVERNOR ARM MOVES FREELY

3.4 BE SURE L.O. COOLER ALIGNED FOR L.O. FLOW

BE SURE L.O. COOLER OIL BY-PASS VLV. POSITIONED 'TO' L.O. COOLER

3.5 BE SURE PRESS. GAGES ALIGNED TO OPERATE WHEN PRESSURIZED

BE SURE PRESS. GAGE CUTOUT VLVS. FULLY OPEN ON THE STEAM, EXH., SUCT., & DISCHG. PRESS. GAGES

3.6 BE SURE FOSP ISOLATED FROM STEAM

BE SURE THROTTLE VLV. & OVERLOAD VLV. CLOSED

3.7 BE SURE THAT HP DRAINS SECURED

BE SURE THROTTLE VLV. HP DRAIN VLVS. CLOSED

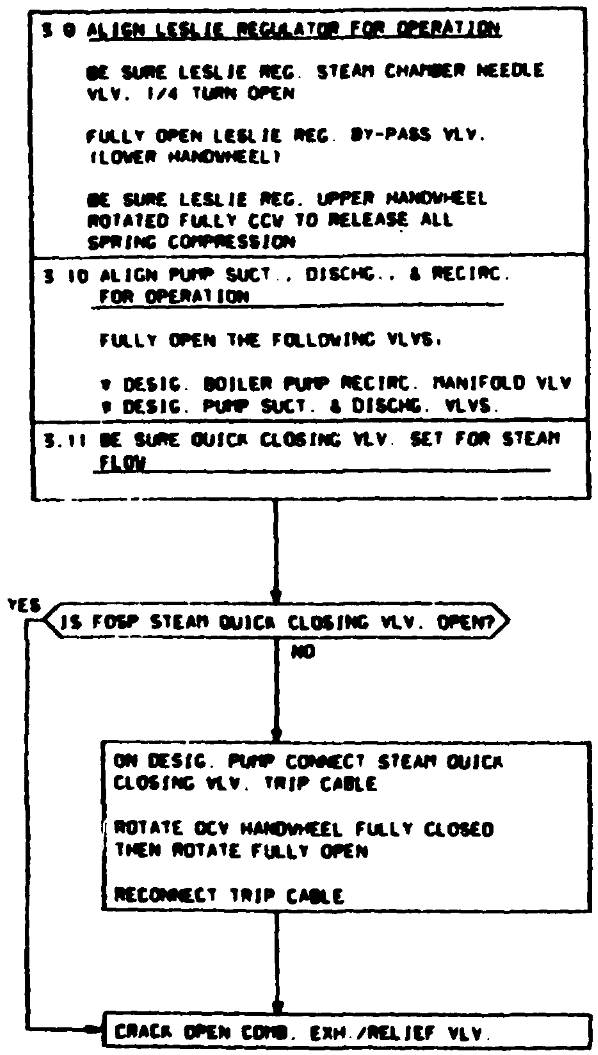
3.8 BE SURE F.W. DRAINS ALIGNED FOR DRAINAGE OF CONDENSATE

BE SURE THE FOLLOWING F.W. DRAIN VLVS. PARTIALLY OPEN:

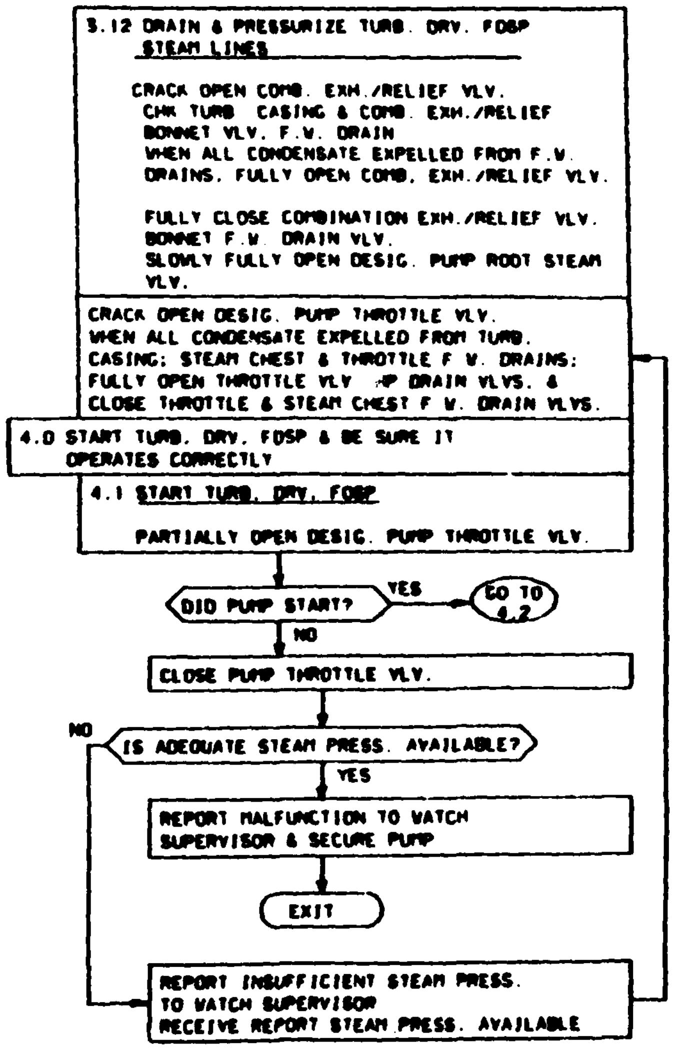
- THROTTLE VLV.
- STEAM CHEST
- TURB. CASING
- COMB. EXH./RELIEF VLV. BONNET

BE SURE DESIG. FOSP LESLIE REG. ACTUATING CUTOUT VLV. CLOSED

SG 3-S PG 6 OF 13



SG 3-S PG 7 OF 13



SG 3-S PG 8 OF 13

4.2 BE SURE L.O. PRESS. & FLOW ARE CORRECT

ADJUST THROTTLE VLV. OPEN TO INCREASE PUMP SPEED & PRESS. ON FOSP L.O. PRESS. GAGE TO A MIN. OF 10 PSI

IS L.O. FLOW IN TURB. L.O. SIGHTFLOW INDICATOR ADEQUATE?

YES → 4.3

NO → CLOSE PUMP THROTTLE VLV. REPORT MALFUNCTION TO WATCH SUPERVISOR → EXIT

4.3 COMPLETE TURB. DRAINAGE

WHEN ALL CONDENSATE EXPELLED FROM TURB. CASING DRAINS: CLOSE F.W. DRAIN VLVS.

4.4 VENT PUMP CASING

CRACK OPEN PUMP CASING VENT VLV. UNTIL ALL AIR EXPELLED; THEN CLOSE VENT VLVS.

4.5 OBTAIN PROPER PUMP DISCHG. PRESS.

AFTER 3-5 MIN. OPEN THROTTLE VLV. TO INCREASE PRESS. ON PUMP DISCHG. PRESS. GAGE TO 420 PSI

4.6 BE SURE PUMP OPERATION NORMAL

CHECK FOSP OPERATION

ARE THERE UNUSUAL NOISES OR VIBS. IN FOSP?

NO →

YES → CLOSE PUMP THROTTLE VLV. REPORT MALFUNCTION TO WATCH SUPERVISOR → EXIT

SG 3-S PG 9 OF 13

4.7 MANUALLY SHIFT LESLIE REG. TO "AUTO" MODE

CLOSE LESLIE REG. BY-PASS VLV. (LOWER HANDWHEEL) UNTIL DISCHG. PRESS. DECREASES TO 410 PSI

SLOWLY, FULLY OPEN THROTTLE VLV.

SLOWLY FULLY OPEN LESLIE REG. ACTUATING CUTOUT VLV.

SLOWLY ROTATE LESLIE REG. UPPER HANDWHEEL CW UNTIL DISCHG. PRESS. INCREASES TO 420 PSI

ROTATE LESLIE REG. LOWER HANDWHEEL TO "AUTO" POSITION

IS MTR. DRV. PUMP TO BE SECURED?

YES → 4.10

NO → 4.8

4.8 STOP MTR. DRV. FOSP

ROTATE MTR. DRV. FOSP MTR. CONTROLLER SWITCH TO "OFF" POSITION

4.9 ISOLATE MTR. DRV. FOSP FROM SYS.

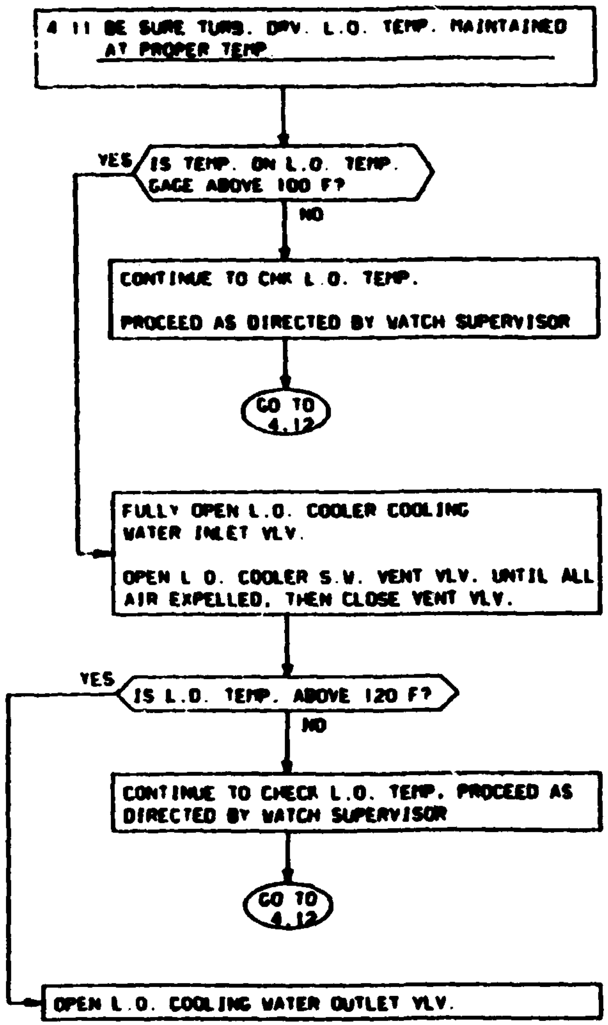
CLOSE THE FOLLOWING MTR. DRV. FOSP VLVS:

* SUCT. & DISCHG. VLVS
* REG. ACTUATING LINE CUTOUT VLV
* REGULATING RETURN CUTOUT VLV. TO DESIC. BOILER

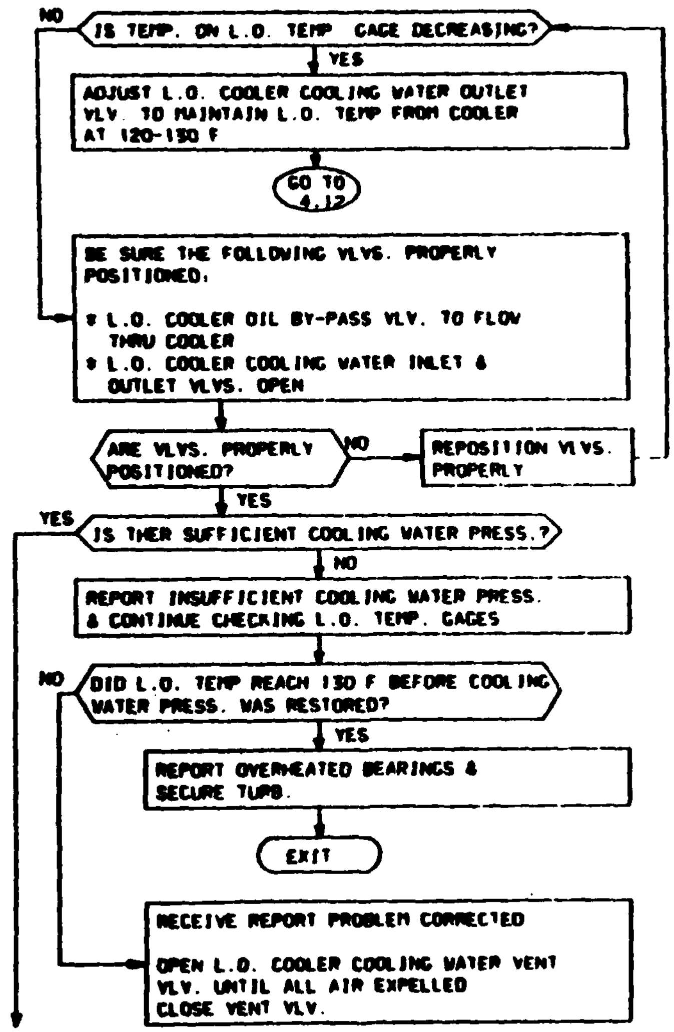
4.10 MAINTAIN TURB. DRV. FOSP DISCHG. PRESS. OF 420 PSI

ROTATE LESLIE REG. UPPER HANDWHEEL UNTIL PRESS. ON FOSP DISCHG. GAGE MAINTAINED AT 420 PSI

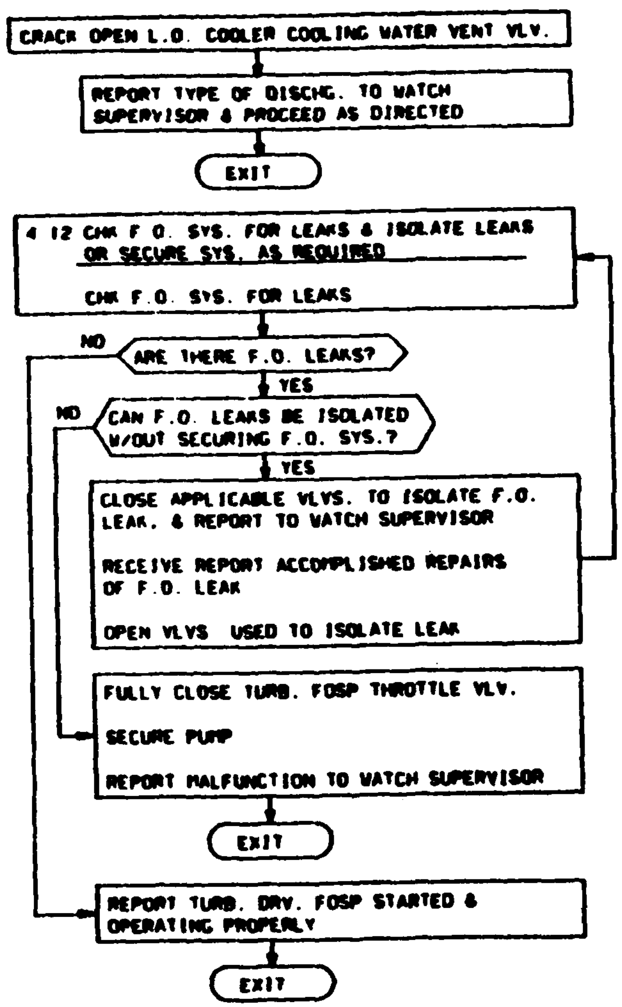
SG 3-S PG 10 OF 13



SG 3-S PG 11 OF 13



SG 3-S PG 12 OF 13



SG 3-S PG 13 OF 13

APPENDIX C

DIRECTIONS FOR DEVELOPING SPPOT GUIDES

DIRECTIONS FOR DEVELOPING SPPOT GUIDES

The information on the following pages includes examples of SPPOT Guide formatting and directions for the development of these documents. In general, SPPOT Guides are descriptions of procedures for operating propulsion systems. They contain two basic types of information: (1) functional statements that indicate what conditions are to be accomplished, and (2) action statements that specify the behaviors that must be performed to accomplish the function. For example, for the functional statement "Start the pump," the action statement might be "Push the start button."

Types of SPPOT Guides

A separate SPPOT Guide is developed for each evolution or condition of operation for each system or subsystem (e.g., "Align the evaporator for operation" or "Secure the Forced Draft Blower"). Evolutions for a given system may include Pre-alignments (to be performed prior to plant startups), Alignments, Starts, Secures, and a number of procedures performed while the propulsion plant is in operation such as Operational Starts, Checks, Secures, Shifts, or Recoveries of equipment or systems.

Types of SPPOT Guide Statements

Higher Order Functional Statements

Higher order functional statements are numbered with a zero following the decimal point (1.0, 2.0, 3.0, etc.) and are always enclosed in a rectangular box that extends to the left of all other boxed statements (see Figure C-1, 2.0).

Lower Order Functional Statements

Lower order functional statements are provided where a procedure is sufficiently complex to require two levels of groupings to maintain a clear overview of its structure. These statements are also numbered but are identified by a lower order decimal digit (2.1, 2.2, 2.3, etc.). They are enclosed in rectangular boxes that may also contain corresponding action statements (see Figure C-1 2.1 and 2.2).

Action Statements

Action statements are not numbered. They are also enclosed in rectangular boxes. Often they are contained in the same box with a lower level functional statement. In such cases, the action statement follows the functional statement and is separated by an underlining (see Figure C-1, 2.1 and 2.2).

Action statements may be separated from functional statements by questions. In such cases, they are enclosed in separate rectangular boxes. When two or more action statements are enclosed in the same box, they are separated by a double spacing (see Figure C-1, 2.1).

Sometimes at the end of a series of functional statements, there will be a requirement to report a system or equipment has been placed under a particular condition (secured, aligned for start-up, etc.). In those cases where the reporting statement covers several of the functional statements that precede it, it is enclosed by itself in a rectangular box as shown in Figure C-1.

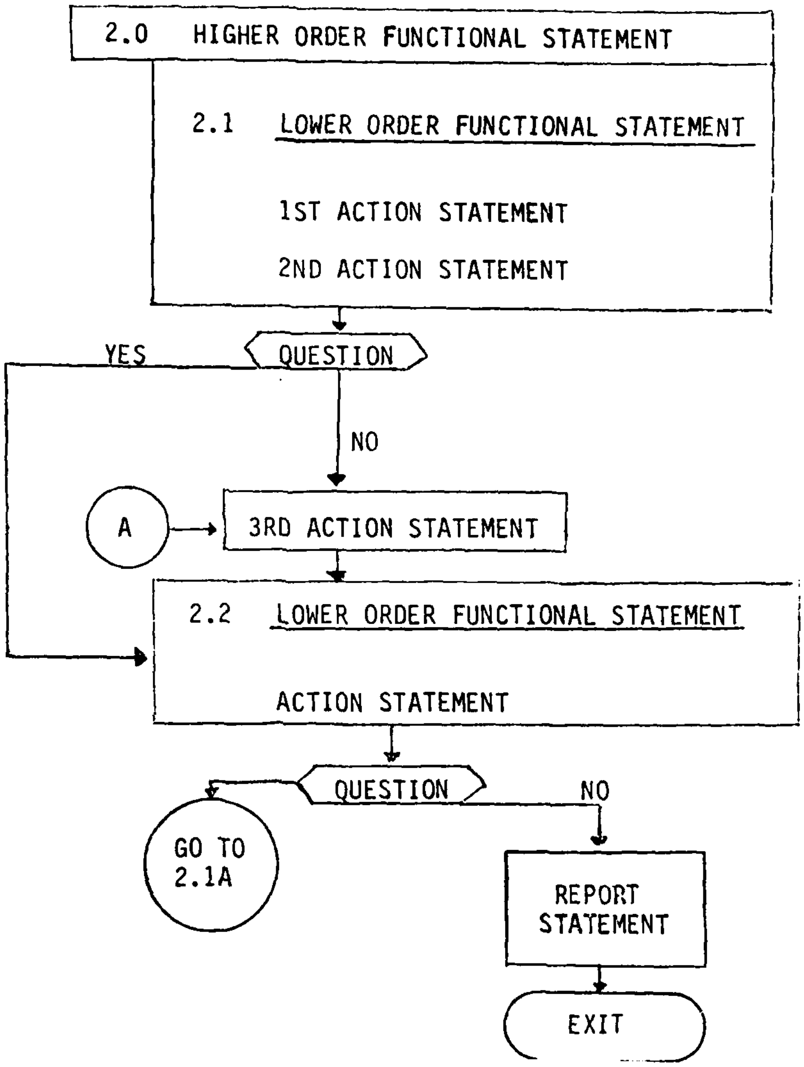


Figure C-1. Example of SPPOT Guide formatting.

Questions

Questions are always enclosed in boxes with pointed ends (see Figure C-1, 2.1 and 2.2). Questions are used to determine:

1. Which of two or more possible procedures are to be followed ("Is the MMR to be pressurized with ship's steam or shore steam?")

2. Whether a particular condition or operation is to be established ("Is the Motor Driven Pump to be secured?")

3. Whether a specific condition or operation has been established satisfactorily. ("Did the Forced Draft Blower Start?" or "Is the pressure on the Oil Pressure Gage above 3 psi?") Note that wherever a reading is specified the appropriate indicator device should be named.

Positional Statements

Statements that indicate a point of entry or departure to or from another procedure or a different point in the same procedure are characterized as positional statements. Positional statements are always enclosed by rounded boxes or circles. Examples of positional statements include:

1. "Enter" statements used at the start of a SPPOT Guide when the SPPOT Guide starts with a question.

2. "Exit" statements used to indicate when a procedure is completed or should be stopped (see Figure C-1 under 2.2).

3. "Go To" statements used to direct the trainee to another portion of the SPPOT Guide. Typically, the statement will indicate the number of a functional heading (e.g., "Go to 2.1"). If the direction is to a specific box under a functional statement, a circled letter "cue" (A, B, C, etc.) will be attached to the box (see Figure C-1). When directed to a specific box, the statement will include the letter cue (e.g., "Go to 2.1A"). An example of the latter type of "Go to" statement is provided in Figure C-1 under 2.2.

Types of SPPOT Guide Branching

Functional Branching

Wherever there are two or more ways of performing a procedure, each of which is described by a series of functional statements, a functional branching is indicated. A functional branch is introduced by a question that indicates the possible choices to be made (e.g., "Is Main Steam to be supplied from own space or by cross-connecting?"). Depending on the response to the question, the reader is directed to an appropriate higher-order functional statement (e.g., 3.0 ALIGN MAIN STEAM BY CROSS-CONNECTING).

Contingency Branching

Whenever there is a functional statement, which indicates a condition to be accomplished, there should be a question statement to indicate whether or not the condition was sucessfully established. If the condition was not successfully established, a remedial loop shold be provided to indicate what, if any, actions should be taken by the watchstander to correct the situation. Remedial loops should include any communications that take place between watchstanders and their supervisors.

Multiple-choice Branching

In some instances, a watchstander will be selecting a single operation or alignment from several choices. This occurs for procedures where a number of alternative equipments may be used (e.g., combinations of boilers, fuel oil pumps, and fuel oil tanks for aligning the Fuel Oil Service System) or where water or oil is to be pumped from one specific location to another (e.g., aligning a Lube Oil Purifier). Where multiple-choice branching is accomplished through a series of decisions, they may be handled with a series of questions (e.g., "Is a Forward or Aft Fuel Oil Service Tank to be used?" or "Is a Port or Starboard Fuel Oil Service Tank to be used?").

In contrast, where branching is to be accomplished by a single decision, the reader would be directed to simply choose the desired alternative.

Directional Arrows

The following conventions are used with respect to directional arrows.

Typically, an arrow down the center is used to indicate a direct series of actions or remedial actions, a left-hand side arrow is used when a set of actions or remedial actions is to be bypassed, and a right-hand side arrow is used for feedback loops that return to earlier statements. Crossing of arrows is avoided. Arrows may also be used to indicate the continuation of an action sequence to the next page.

Wherever an arrow is blocked by the configuration of the diagram or must be taken to a statement other than the first statement on a succeeding page, a "Go To" statement is used.

Consistency of Statements

Every time a given type of function occurs, it should be treated in the same manner. For operations such as starting pumps, draining condensate, etc., a standard format should be established and followed.

SPPOT Guide Designations

SPPOT Guides are assigned alphanumeric designations that identify the system and the evolution being performed. For example, SPPOT Guide 2-S designates the start-up of System 2, the Forced Draft Blower. Where subsystems are involved, they are designated with decimals. For example, 17.1-S is the designation for start-up of the Deaerating Feed Tank that is a subsystem under system 17, the Main Condensate System.

Where systems vary from one machinery space to another, they are also given space designations. For example, the designation for Aligning the 150 psi Auxiliary Steam System in #2 Main Machinery Room is 8-A2. The designation for the same type of alignment for #3 Main Machinery Room would be 8-A3.

Systems that are located in auxiliary spaces are designated by an X. For example, the designation for aligning the Auxiliary Lube Oil Purifier is 30-AX.

APPENDIX D

SURVEY QUESTIONNAIRE ON SPPOT GUIDES

EVALUATION OF FORMATS FOR PROPULSION PROCEDURES

Not long ago, some of the personnel on your ship had an opportunity to use and evaluate sets of propulsion procedure sheets that were designed for training watchstanders. Based on their comments, we have developed a new pocket guide for presenting these same procedures. In the following questionnaire we would like you to examine the five examples of the new pocket guide, compare them against the large procedure sheets that were used before, and let us know which format you would prefer for training in your present watchstation. As an experienced professional, you are in the best position to decide what works and what does not. Your opinions will help us make these aids as useful as possible. Thanks for your help!!!

NAME: (Optional) ______________________________ SPACE: ______

WATCHSTATION OR JOB TITLE: ______________________________

RATE/RANK: ______________________________

LENGTH OF MAIN PROPULSION EXPERIENCE: ______________________

"A" SCHOOL GRADUATE? ______________________________

1. Did you get to work with (or observe the use of) any of the large sheets of propulsion procedures?

   YES ___ NO ___

   If yes, for which tasks?

   ____
   ____
   ____
   ____

2. Which do you believe would be easier to use for training?

   PROCEDURE SHEETS ___ POCKET GUIDES ___ NO DIFFERENCE ___

   Can you explain your answer?

   ____
   ____
   ____

3. Which do you believe makes it easier to understand why actions are being performed?

PROCEDURE SHEETS ___ POCKET GUIDES ___ NO DIFFERENCE ___

Can you give examples?

____

____

____

4. Which uses terms and abbreviations that are easier to understand?

PROCEDURE SHEETS ___ POCKET GUIDES ___ NO DIFFERENCE ___

Can you explain?

____

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5. Which do you think would be easier to follow without losing your place?

PROCEDURE SHEETS ___ POCKET GUIDES ___ NO DIFFERENCE ___

Can you explain?

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6. Which do you think would be easier to use when you have to find a specific part of an operational procedure (i.e., starting a motor driven FDB)?

PROCEDURE SHEETS ___ POCKET GUIDES ___ NO DIFFERENCE ___

Can you explain?

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7. Which do you think will be easier to handle and store?

PROCEDURE SHEETS ___ POCKET GUIDES ___ NO DIFFERENCE ___

Can you explain?

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8. Can you think of any ways to improve the new pocket guides?

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9. Do you have any other comments about how these materials should be designed or used?

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